



# The Mobile Economy

## North America 2017



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The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

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# 1

# Executive Summary





## A \$250 billion market due to high levels of penetration and customer spend

North America will reach 300 million mobile subscribers in 2018, growing to 313 million or 84% penetration by 2020. With many subscribers owning more than one connected device, and the cellular M2M market continuing to grow, the total number of connections will be higher, at 585 million by 2020. US subscribers account for 90% of regional market, and the country is the largest market in the world in terms of mobile revenue. North America as a whole accounts for more than a fifth of total global mobile revenue at \$250 billion in 2017.

The region is a benchmark for rapid migration to next-generation devices and networks, with 81% smartphone adoption and 84% LTE adoption

forecast by 2020. The high propensity among consumers to adopt new technologies certainly plays a role: the US is currently the only market in the world where the most highly engaged mobile users are predominant – and this segment will account for 53% of total smartphone users by 2030.

Consumer engagement across all mobile use cases also drove a ninefold increase in mobile data traffic between 2012 and 2016 in the US. Going forward, newer technologies such as augmented reality (AR) and virtual reality (VR), as well as network developments (LTE Advanced Pro, 5G) will further drive video traffic growth.



## North America will lead the way on 5G: nearly 50% adoption by 2025

North America is expected to see the same rapid pace of adoption of 5G services as seen with 4G. The region will reach 100 million 5G connections in 2023, four years after launch, as it did for 4G. 5G adoption will occur faster than in any other region – around half of connections will be on 5G networks by 2025, compared to around 30% in Europe and the leading Asian markets (China, Japan and South Korea in aggregate).

Fixed wireless will be the initial use case for early 5G deployments by Verizon and AT&T. Verizon will launch 5G fixed wireless services in 2018, following tests across 11 metropolitan areas in 2017. Beyond fixed wireless, US mobile operators are expected to launch their standardised mobile 5G services in 2019, with Canada following a year later.



## Larger operators in the US are tapping into new businesses in an evolving ecosystem

AT&T and Verizon are driving the current phase of telecoms and media convergence as the operators look to diversify away from core mobile services and compete more effectively with the internet players. AT&T is taking a lead position in the global media and entertainment industry through large-scale acquisitions – DirectTV and Time Warner (pending approval) – while Verizon has made several smaller acquisitions in the digital media and Internet of Things (IoT) markets. Oath (the integration of Yahoo and AOL) gives Verizon a platform of 1 billion users worldwide, as well as greater presence in the digital advertising industry.

These new businesses strengthen the operators' convergence capabilities and add B2C/B2B customer relationships in an evolving telecoms, media and technology (TMT) ecosystem. Mobile and video will increasingly play a central role and IoT is also now scaling rapidly. While price competition for traditional mobile services will continue to be intense (with all major operators offering unlimited data plans and lower entry tariffs compared to the past), the new businesses provide further revenue streams to supplement core mobile revenues.



## Future competitive landscape will also depend on M&A and partnerships

Any further M&A deals will have a significant impact on the future competitive landscape and on operator revenues and profitability in the US mobile market. Convergence and lighter touch regulation are likely to drive further deals, with the latter potentially opening the door to consolidation between mobile operators.

Different M&A scenarios are possible, from mobile consolidation to cross-sector convergent deals (e.g.

mergers or partnerships between mobile and cable companies). The first scenario provides the greatest scope for operating synergies and could see a more stable competitive outcome, while the latter could increase competitive pressures as new players compete for share. The outcome is highly uncertain, with a range of players from across the TMT market and numerous potential outcomes.



## Mobile contribution to North America's economy will reach \$1 trillion by the end of the decade

In 2016, mobile technologies and services generated 3.9% of GDP in North America, a contribution that amounted to \$790 billion of economic value added. By the end of the decade, this contribution will increase to just over \$1 trillion (4.7% of GDP) as greater use of mobile technologies, including M2M and IoT solutions, drives improvements in productivity.

The mobile ecosystem supported 2.5 million jobs in 2016. This includes workers directly employed by

mobile operators and the wider mobile ecosystem, and jobs that are indirectly supported in the rest of the economy by the activity generated by the sector. The sector also makes an important contribution to the funding of the public sector, with \$110 billion raised in 2016 in the form of general taxation, including sales taxes, corporate taxes and employment taxes.



## North America at the forefront of innovation and IoT developments

2017 is set to reach an all-time record for investor financing in North America – this confirms the role of the region as the heart of technology innovation and digital transformation. Financing is also supporting growth in the wider mobile ecosystem, with IoT and artificial intelligence (AI) at the vanguard.

According to Machina Research, the number of IoT connections will increase fourfold between 2016 and 2025 in North America, reaching nearly 6 billion.

Mobile operators are driving growth in IoT through mobile IoT technology deployments and the provision of IoT solutions beyond connectivity, often via partnerships. Verizon and AT&T have recently announced nationwide launches of LTE-M technology. Both companies operate across several verticals, including those that have been attracting significant investor financing over recent years – connected and autonomous vehicles, digital health, smart homes and cities, manufacturing and logistics, and energy/utilities. IoT is a \$1 billion business for Verizon (2016 revenue) and is growing at about 20% year-on-year.



## Artificial intelligence is the next frontier

While the AI industry is currently dominated by six platform players – Google, Amazon, Apple, Facebook, Microsoft and IBM – US mobile operators are increasingly focusing on AI through venture-capital (VC) investments, technology and business ventures (e.g. Verizon's Exponent) and R&D (e.g. AT&T's Lab), with widespread recognition that AI is key to business transformation and IoT developments.

AI creates opportunities for US and Canadian mobile operators to optimise their networks and CRM systems, and increase operational efficiencies. Greater learning of customer behaviour and preferences will also enhance B2C/B2B services within and beyond core businesses. Meanwhile, new challenges are emerging, such as the rise of voice-driven, Wi-Fi connected AI-based devices (e.g. Amazon Echo, Google Home), which are increasingly becoming a control point for the connected home.

# MOBILE ECONOMY NORTH AMERICA

Unique  
mobile  
subscribers



SIM connections



Smartphone connections to increase from 78% of total in 2016 to

**81%**  
by 2020

# 4G 5G

4G connections to increase from 63% of total in 2016 to

**84%**  
by 2020

By 2025, there will be

**208m**  
5G connections,  
**49%**  
of all connections

*Excluding M2M*



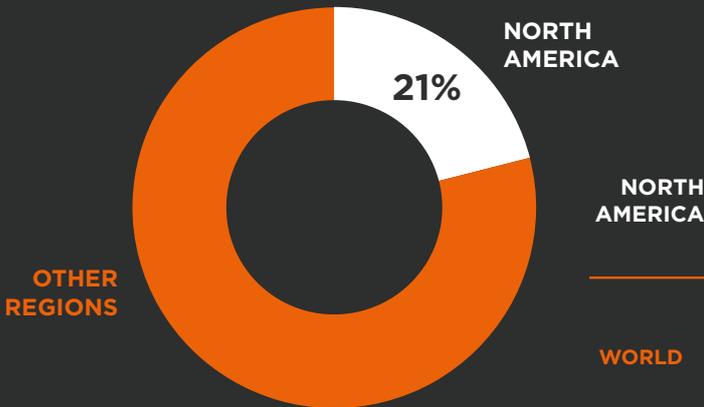
Operator CAPEX of up to

**\$136 billion**

for the period 2017-20

# Operator total revenues

2020



NORTH AMERICA **\$236 billion**

WORLD **\$1.1 trillion**



## Mobile industry contribution to GDP

2016

**\$790bn**

3.9% GDP

2020

**\$1.02tn**

4.7% GDP

## Public funding

Mobile ecosystem contribution to public funding (before regulatory and spectrum fees)

**\$110bn**

2016



## Employment



Number of jobs directly and indirectly supported by mobile ecosystem

**2.5m**

2016

# 2

# Mobile industry overview



# 2.1 North America will reach milestone of 300 million mobile subscribers in 2018

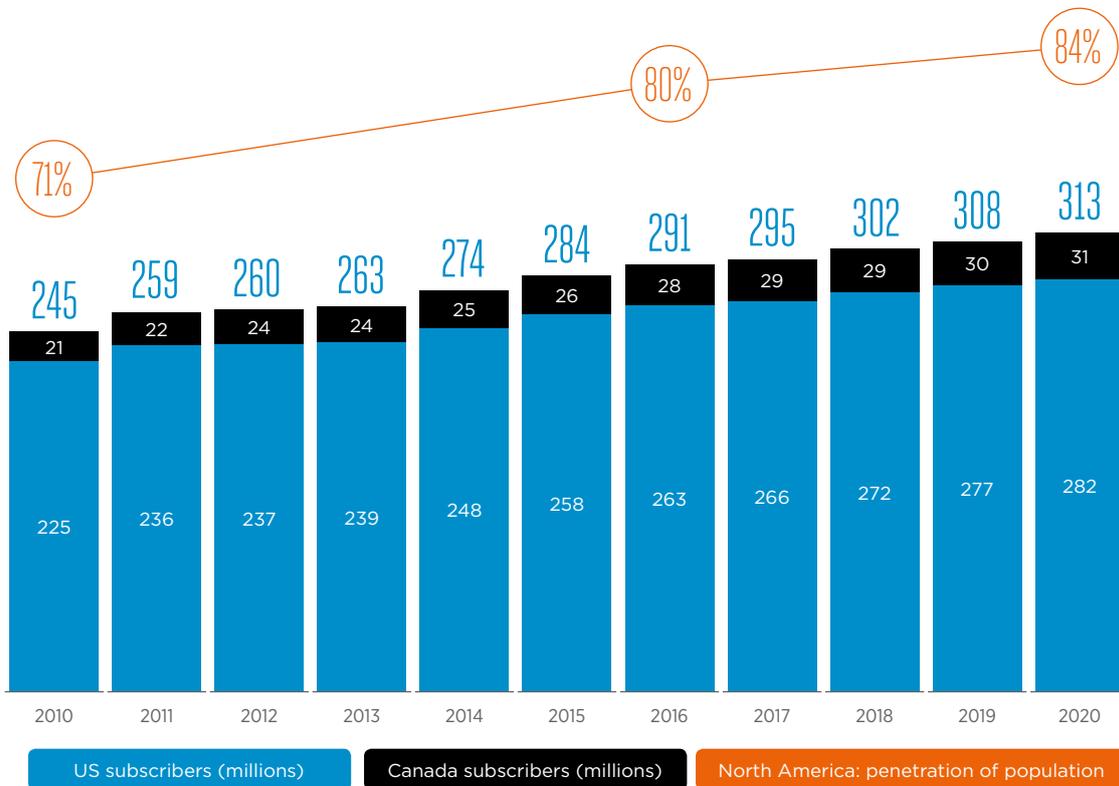
As of June 2017, more than 290 million people subscribed to mobile services in North America, with the US accounting for 90% of the regional subscriber market and Canada the remaining 10%.<sup>1</sup> The region will reach 300 million mobile subscribers in 2018, and 84% penetration of population by the end of the decade, up from 80% in 2016. While mobile penetration among younger people (under 18 years old) will continue to grow, the increase will be predominantly driven by new mobile subscribers among the over 65-year-olds.

Mobile subscribers differ from mobile connections such that a unique user can have more than one connected device and associated SIM card. As such, the number of mobile connections in North America was 380 million in 2016, and will reach 410 million by 2020. There will therefore be four SIM cards for every three subscribers (a SIM ownership ratio of 1.3). Cellular M2M will also be a major driver of connections growth in North America, bringing the total number of connections to 585 million by the end of the decade.

Figure 1

Source: GSMA Intelligence

## Unique mobile subscribers and penetration



Note: totals may not add up due to smaller countries and rounding.

The total number of mobile connections (585 million by 2020) is higher than that of mobile subscribers due to multiple device ownership and M2M.

1. North America includes Bermuda, Greenland, and Saint Pierre and Miquelon. These countries have over 100,000 mobile subscribers in total (2016). Note that Mexico is included in the scope of our Mobile Economy Latin America report.

High subscriber penetration coupled with historically high consumer spend on mobile services mean the mobile market in North America will be worth \$250 billion in revenues in 2017. The US is the largest market worldwide in terms of revenue (at \$230 billion in 2017) – about 45% greater than China, and bigger than the entire European mobile market.

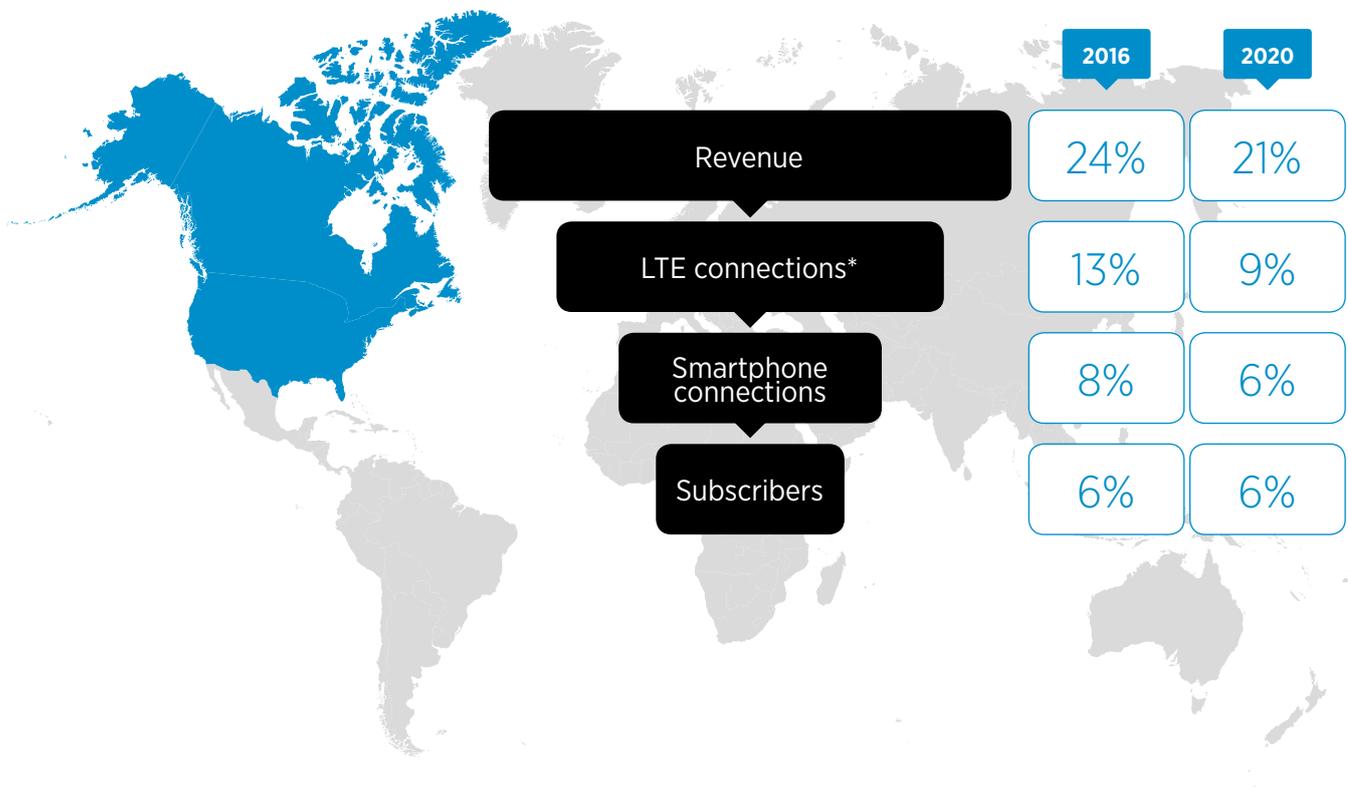
High spend on mobile services has also boosted North America's revenue contribution to the global mobile market. While the region accounts for about 10% in key global metrics such as subscribers, smartphones and LTE connections, its contribution to global mobile revenue is more than 20%.

Figure 2

Source: GSMA Intelligence

## North America's contribution to the global mobile market

\* LTE connections excluding M2M



## 2.2 US and Canada are a benchmark for fast migration to new mobile technologies

The US and Canada are notable examples of markets where migration to next-generation devices and networks has been fast. Both were among the first few countries in the world to reach 50% smartphone adoption in 2012, and 50% LTE

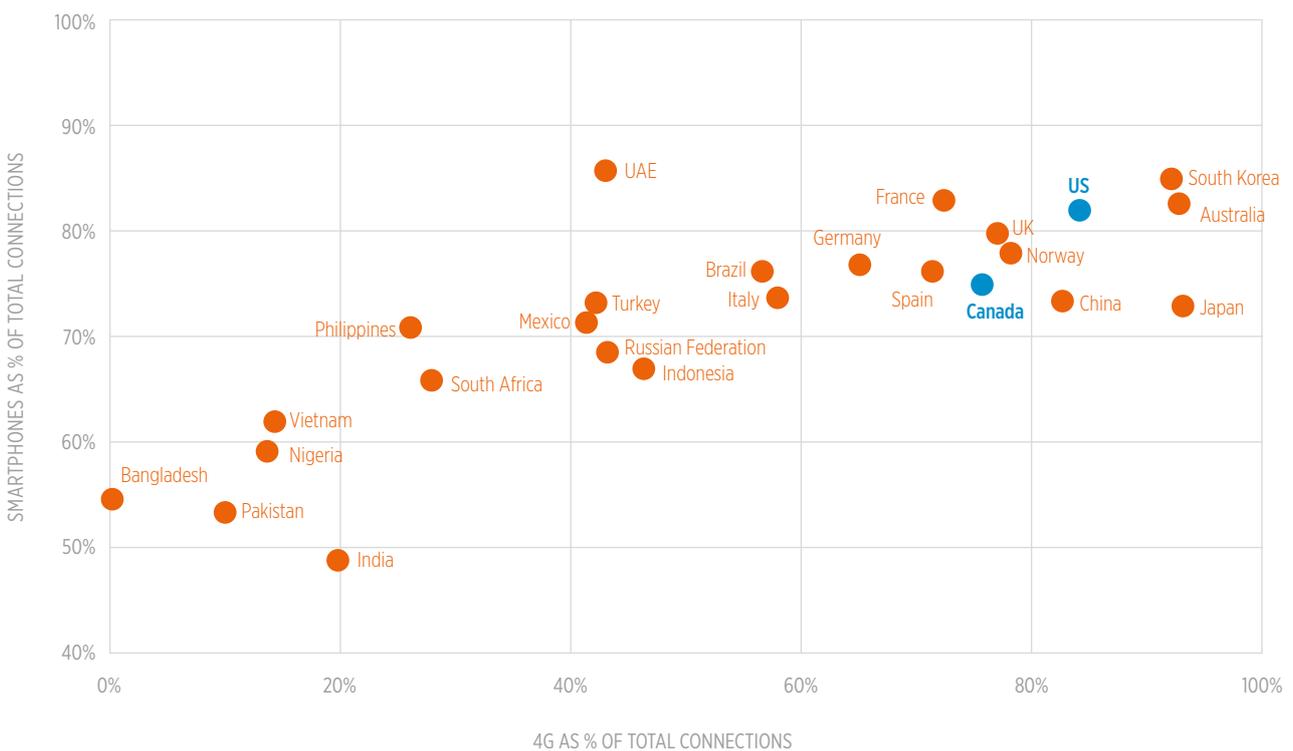
adoption three years later. By 2020, four out of five mobile connections will operate on smartphones connected to LTE networks. Only a few countries worldwide will have reached a similar level of uptake.

Figure 3

Source: GSMA Intelligence

### Smartphone and 4G adoption in 2020 for select countries

Percentage of total connections excluding M2M



Fast adoption of new mobile technologies is being driven by several supply- and demand-side factors. Rapid rollout of 4G networks has certainly played a key role. In the US, 4G coverage grew from 35% to 90% of population in just two years (2011/2012). 4G services are currently available to 99% and 97% of the populations in the US and Canada respectively. Operators have also invested heavily in acquiring mobile spectrum, particularly over the last three years – \$60 billion in the US (including the 600 MHz auction concluded in 2017) and \$7 billion in Canada.

Consumer behaviour also plays a fundamental role. Mobile users in the US and Canada have high propensity to adopt new mobile technologies and digital services & content at an early stage, and show high levels of mobile engagement across both established and emerging use cases.

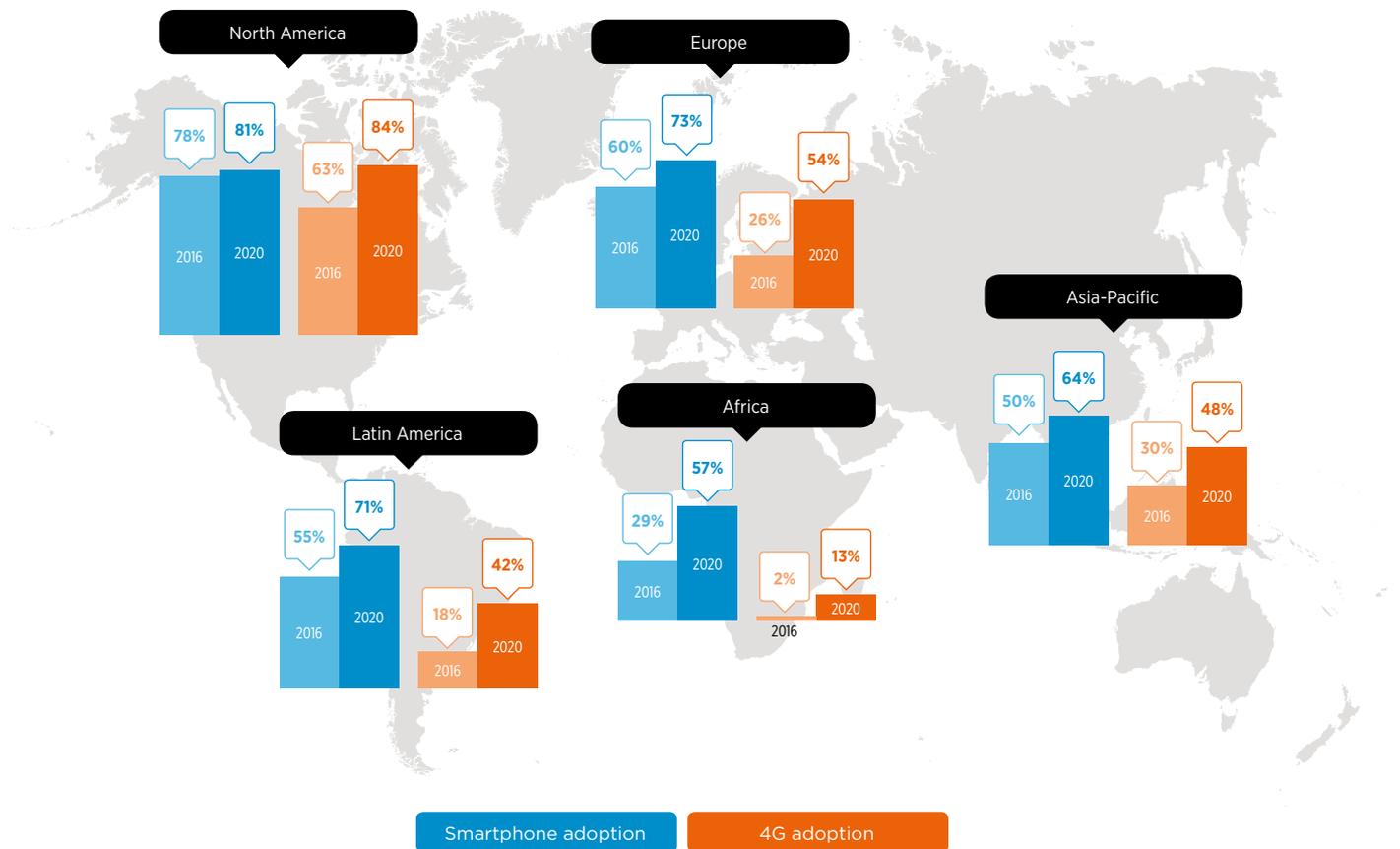
At a regional level, North America has not only the highest penetration of mobile internet worldwide but also the most advanced technology mix, as most people access internet through their smartphones connected to 4G networks. Today, two thirds of the population (nearly 240 million people) are mobile internet users in North America. A further 35 million people will start using mobile internet between now and the end of the decade, bringing mobile internet penetration to three quarters of the population. Smartphone and LTE adoption rates will stand at 81% and 84% respectively in North America by 2020 – by some distance the highest of any region.

Figure 4

Source: GSMA Intelligence

## Smartphone and 4G adoption

Percentage of total connections excluding M2M





## 2.3

# Rapid transformation from connected to digital consumer

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The transformation of mobile customers from ‘connected’ (those connected to cellular networks) to ‘digital’ (those consuming digital services and content on a regular basis, with heavy data usage) has been fast in the US and Canada. This has been driven by nationwide LTE network coverage, high consumer adoption of LTE-capable smartphones, and a growing range of digital services and content available to consumers.

Most smartphone owners in North America use their phones on a regular basis to access internet communications services, social networks, entertainment content, e-commerce, health and financial services. Looking at the smartphone user engagement analysis shown in Figure 5:

- Engagement among users in the US is consistently higher than the developed world average across all mobile activities.
- The widest difference between the US and the developed world is in digital commerce and entertainment. This reflects the rapid growth in internet-based services such as Amazon Prime and Netflix. Amazon Prime has more than 80 million members in the US, while Netflix reached a milestone of 50 million paid subscribers in June 2017, after adding nearly 10 million over the last two years.
- In Canada, smartphone owners make greater use of digital commerce and financial services compared to the average in the developed world, but the overall user frequency score is roughly aligned with the developed world.

Figure 5

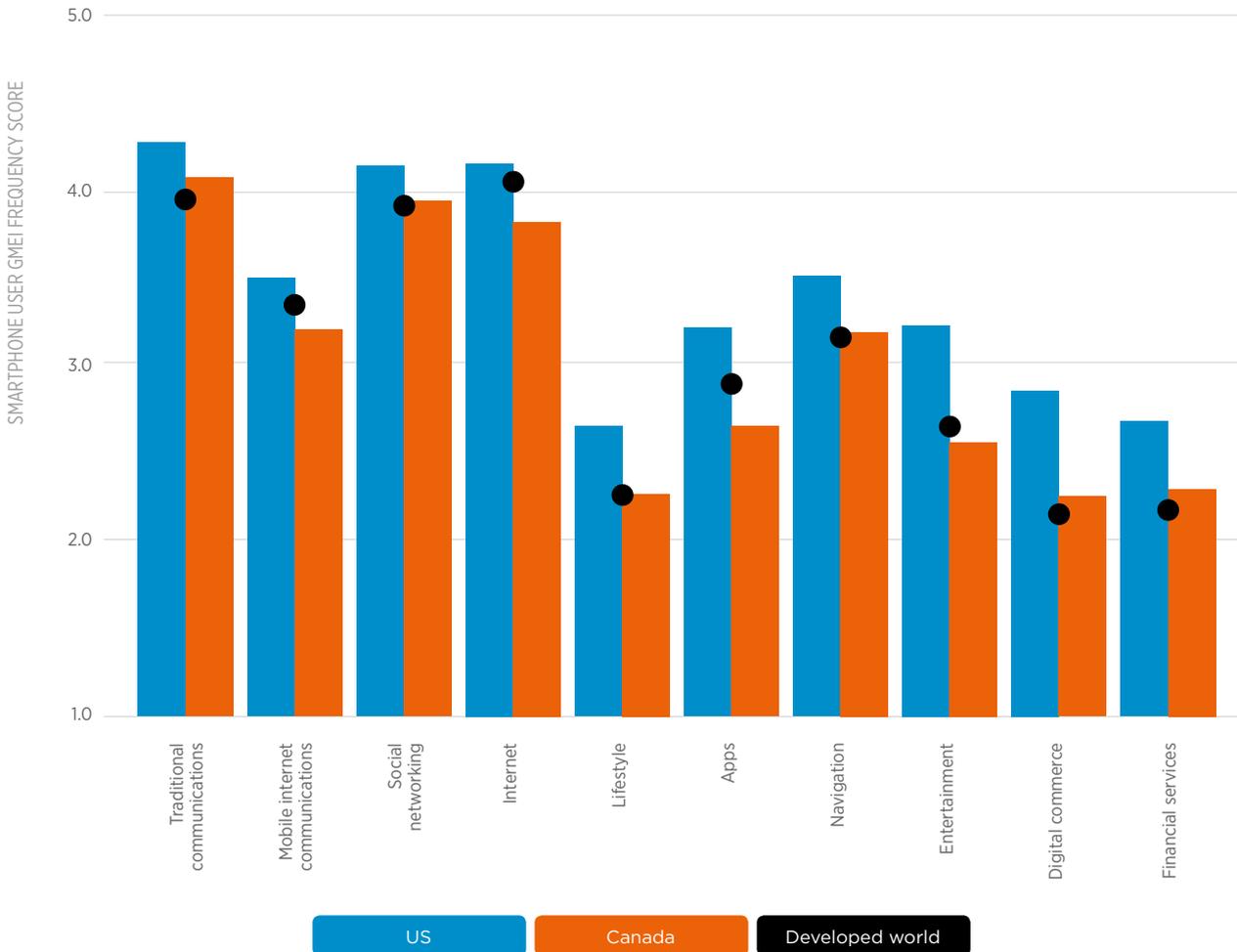
Source: GSMA Intelligence Global Mobile Engagement Index (GMEI)

## Smartphone user engagement

**Question:** how frequently, if at all, do you do any of the following activities on your smartphone?

Frequency score scale:

**1** (never), **2** (less than once a month), **3** (every month), **4** (every week), **5** (every day).



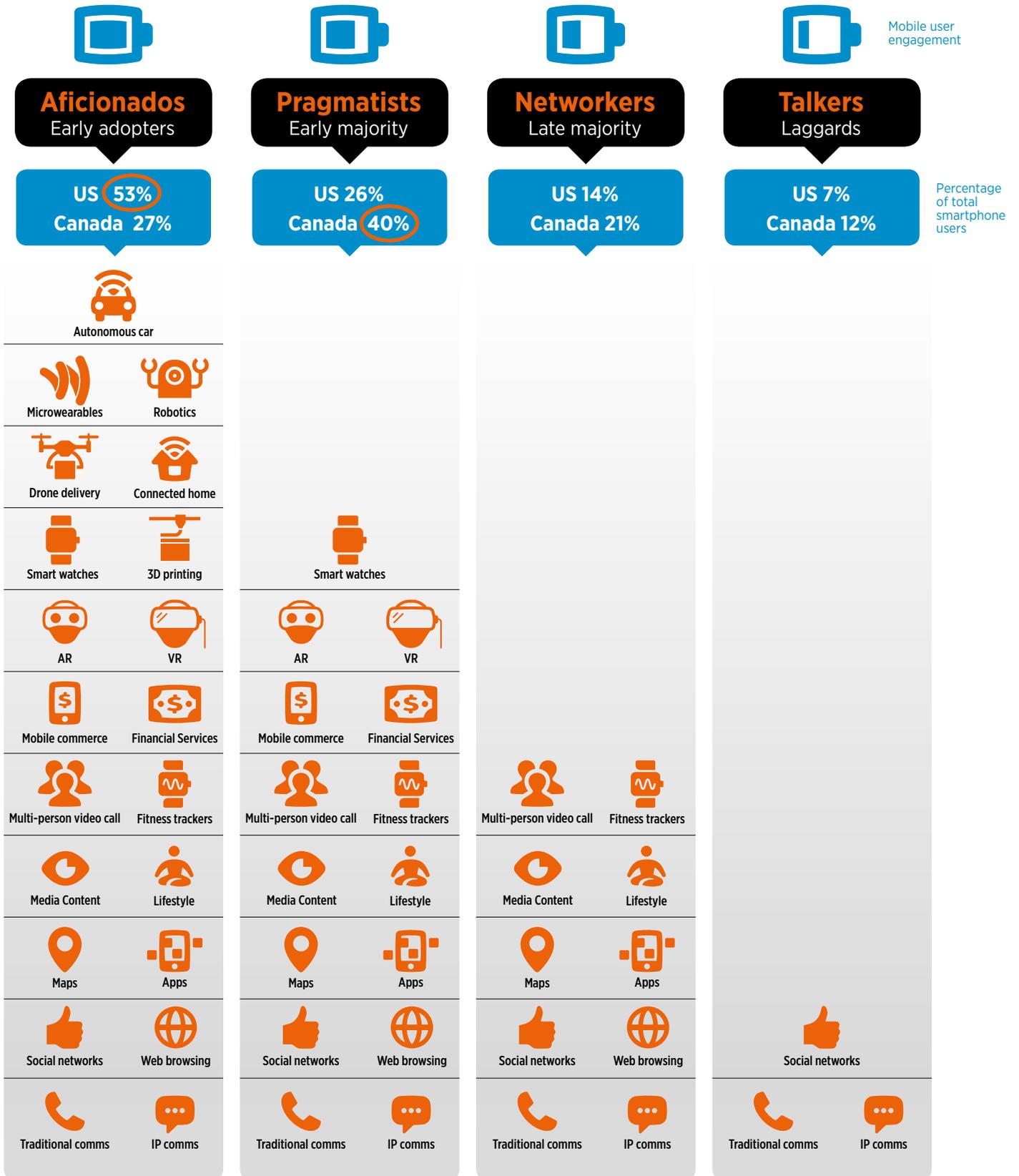
A deeper look at the segmentation groups of smartphone users by their mobile engagement pattern – Aficionados, Pragmatists, Networkers and Talkers – reveals that the US is currently the only market in the world where the most highly engaged mobile users (Aficionados) are predominant. Indeed, Aficionados – an exclusive group of very tech-savvy mobile consumers, primarily connected to 4G

networks – accounted for 48% of total smartphone users in 2016, and will account for 53% by 2030 (see Figure 6). In Canada, the Pragmatists – those who have high usage across most use cases, but a preference for free content – are and will continue to be the largest segment (accounting for 40% of all smartphone users by 2030).

Figure 6

Source: GSMA Intelligence Global Mobile Engagement Index (GMEI)

## Smartphone user segmentation by engagement pattern, 2030



High mobile consumer engagement, particularly in digital content delivered through video (e.g. movies, music, games, advertising) has driven fast growth in mobile data traffic. In the US, over 60% of smartphone owners watch online video (e.g. YouTube, embedded video and live streaming every week, of which 34% do so every day. Weekly usage reaches near ubiquity among 18–24 and 25–34 year-olds.<sup>2</sup>

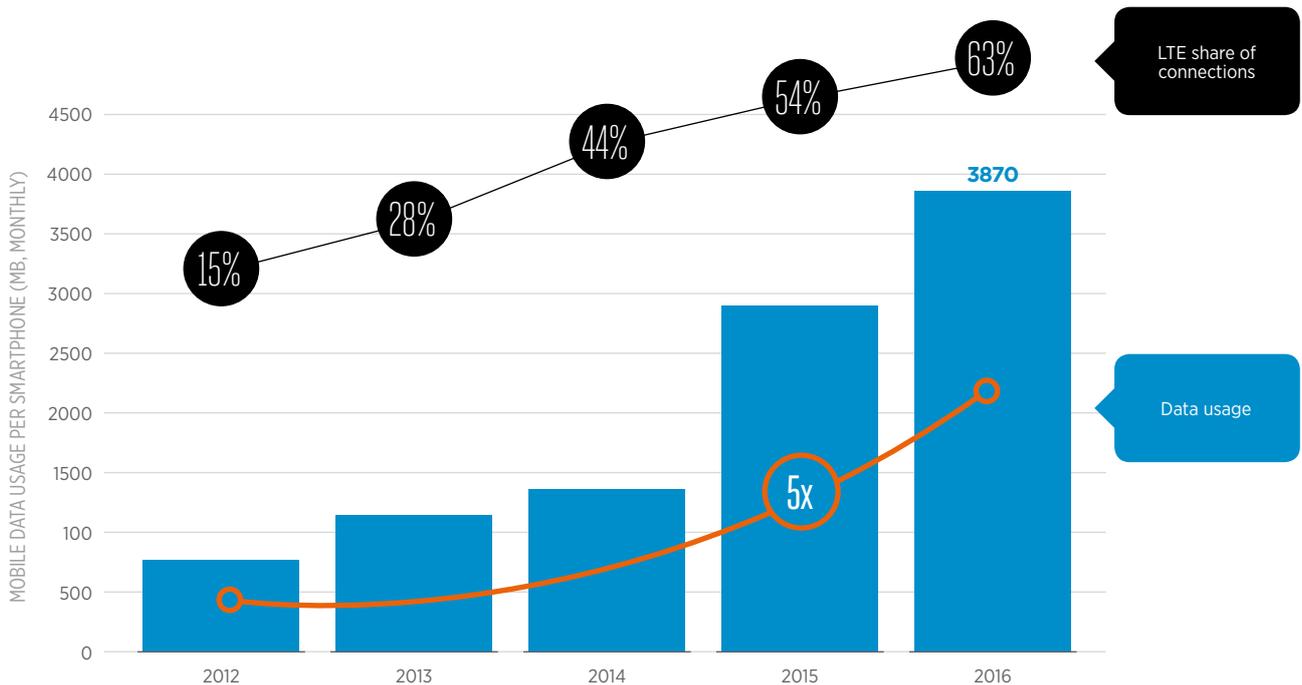
Mobile data traffic grew ninefold between 2012 and 2016 in the US, reaching 13.7 trillion MB. In 2016, smartphone users consumed on average nearly 4

GB of mobile data per month, a fivefold increase compared to 2012. Fast LTE adoption is a key driver as 4G adoption grew from 15% to 63% during the same period, boosting mobile video traffic. Going forward, newer technologies and devices such as AR and VR, as well as further cellular network developments (such as LTE Advanced Pro and 5G commercial launch in 2019) will further drive video traffic growth. Cisco forecasts that mobile data traffic will grow fivefold in the US between 2016 and 2021. Video will account for nearly 80% of mobile traffic in 2021, up from over 60% in 2016.

Figure 7

Source: CTIA and GSMA Intelligence

## Mobile data traffic and LTE adoption in the US



Note: LTE adoption measured as a percentage of total mobile connections, excluding M2M

2. GSMA Intelligence Consumer Survey 2016

## 2.4

# North America will lead the way on 5G: nearly 50% adoption by 2025

### Setting the groundwork for 5G

The North America mobile industry is developing and preparing to deploy 5G while awaiting finalisation of standards. In the accelerated schedule recently agreed by the 3rd Generation Partnership Project (3GPP), complete specifications for both non-standalone and standalone 5G standards are expected in 2018.<sup>3</sup> The US is moving faster than Canada – all four major mobile operators have announced their 5G plans and some of them are currently conducting fixed wireless trials across major metropolitan areas (see Figure 8).

Fixed wireless – the use of 5G as a last-mile technology – will be the initial use case in early 5G deployments for Verizon and AT&T. Both operators have investments in video content producers and will use fixed wireless 5G to supplement their existing fibre networks. Verizon will launch these fixed wireless services in 2018, following tests across 11 metropolitan areas in 2017. Beyond fixed wireless, US mobile operators are expected to launch their standardised mobile 5G services in 2019. Canada will follow a year later.

5G trials are currently using varying spectrum bands – sub-1 GHz, 1–6 GHz and above 6 GHz. Verizon and AT&T have also acquired companies for their high-frequency millimetre wave (mmWave) band holdings. The large bandwidth available at these frequencies makes them suitable to deliver exceptionally high data throughput, though the fast signal attenuation limits the phone coverage area.

Licensed bands will be crucial to 5G development as they allow quality control and the maximum potential to be realised. However, unlicensed spectrum may be required to ease capacity constraints for operators. In the US, the FCC has proposed unlicensed frequencies in the 57–71 GHz range for 5G use, and has authorised LTE-U devices in the 5 GHz band.

3. Standalone 5G means that the control signals, coverage and data transmission are entirely on 5G New Radio (NR), not relying on 4G.



Figure 8

Source: Company announcements

## US major mobile operators' plans for 5G

<p><b>Verizon</b></p> <ul style="list-style-type: none"> <li>• Verizon is currently focusing on a 5G fixed wireless strategy. It aims to offer fixed wireless services to pilot customers in 11 metropolitan areas in 2017, followed by larger-scale launches in 2018. Standardised mobile 5G will likely be launched in 2019.</li> <li>• The company has previously established its own 5G technical forum with a number of equipment vendors, subsequently completing and releasing its own 5G radio specification.</li> </ul>	<p><b>AT&amp;T</b></p> <ul style="list-style-type: none"> <li>• AT&amp;T is currently focusing on its “5G Evolution” initiative which involves a series of fixed wireless high-speed connectivity trials across major metropolitan areas in 2017. This initiative is laying the foundation for 5G, although these networks utilise LTE Advanced Pro technologies.</li> <li>• The company will look to launch 5G commercial services once standards are agreed and as an evolution from its existing network deployments.</li> </ul>
<p><b>T-Mobile</b></p> <ul style="list-style-type: none"> <li>• T-Mobile recently announced plans to begin rolling out a 5G network in 2019, with the goal of achieving nationwide coverage by 2020.*</li> </ul>	<p><b>Sprint</b></p> <ul style="list-style-type: none"> <li>• Sprint has announced plans to develop and launch a 5G network and devices by the end of 2019.</li> </ul>

\* T-Mobile has highlighted its low-band 600 MHz spectrum as key to nationwide rollout, allowing rapid deployment compared to some of the higher frequency 5G bands.

## Fast 5G customer adoption

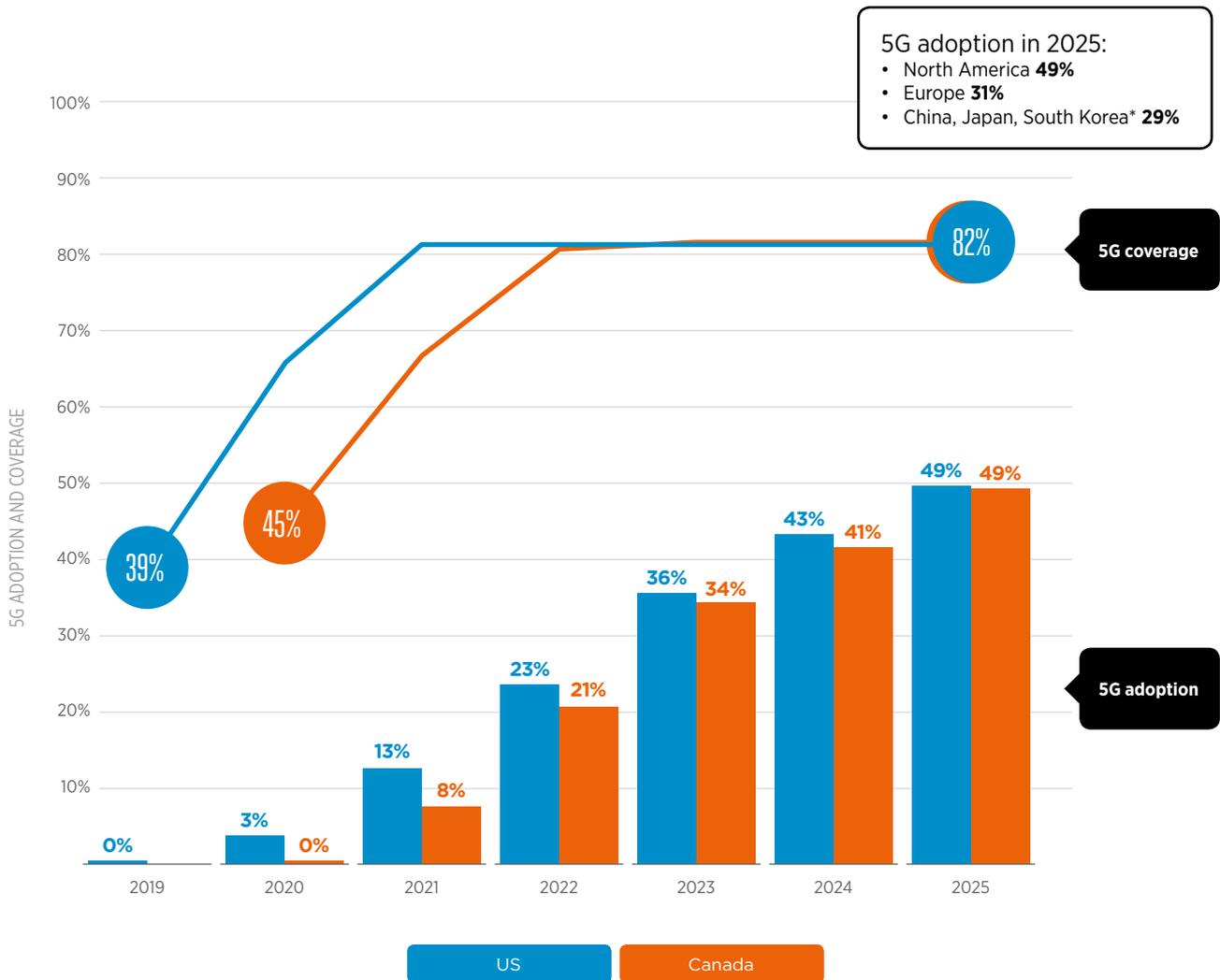
5G adoption will likely grow as fast as 4G adoption did in North America. The region will reach 100 million 5G connections in early 2023, four years after launch, as it did for 4G. By 2025, it will have nearly 210 million 5G connections, of which around 190 million will be in the US and nearly 20 million in Canada.

5G adoption in North America will also occur faster than in any other region in the world (see Figure 9). Around half of connections will be on 5G networks in both the US and Canada by 2025, compared to 30% adoption in Europe and in key Asian markets (China, Japan and South Korea in aggregate).

Figure 9

Source: GSMA Intelligence

### 5G adoption and coverage in US and Canada



Note: 5G adoption measured as percentage of total connections, excluding M2M. Coverage measured as percentage of population. \*In aggregate.



We expect US and Canadian operators to roll out 5G at a similar rate to the deployment of 4G. 5G coverage will reach two thirds of the population in the first two years, and will stabilise at about 80% afterwards.<sup>4</sup> There has also been increased investment in fibre networks, which can backhaul data and provide a competitive edge in the move to 5G. Verizon acquired XO Communications' fibre business in 2016, and recently announced the acquisition of fibre infrastructure in Chicago from WideOpenWest.

The ability to apply a pricing premium will largely depend on how operators position 5G beyond its network capabilities. As the latest LTE developments are reaching speeds that are as high or nearly as high as 5G, operators will need to stimulate customer migration through innovative and segmented customer propositions that combine mobile and video experiences. 4K/8K ultra-HD video, AR/VR devices and applications for gaming and immersive TV, as well as digital services and content for connected stadia and smart cities, will be key early drivers for 5G adoption. Subsequently, as new technologies mature (AI, autonomous vehicles, data analytics, advanced AR/VR), new use cases for 5G will likely emerge, particularly in the enterprise segment, which is largely considered the major source of new operator revenues for 5G.<sup>5</sup>

4. 5G network coverage is based on >1 GHz spectrum bands, limited to urban areas.

5. See [The 5G era: Age of boundless connectivity and intelligent automation, GSMA, 2017](#), for further details on the mobile industry's collective vision and expectations for the 5G era.

# 2.5 US mobile market: challenging outlook for traditional mobile revenues

The US has been one of healthiest mobile markets in the world over the last decade due to mid-single-digit revenue growth, high subscriber spend on telecoms services, solid profitability and cash flows. However, current pressure on traditional mobile revenue (with a 0.2% year-on-year decline in the first six months of 2017) is raising an unprecedented number of questions about the future outlook as well as comparisons with Europe where mobile revenue peaked in 2008 and has declined since then across most markets.

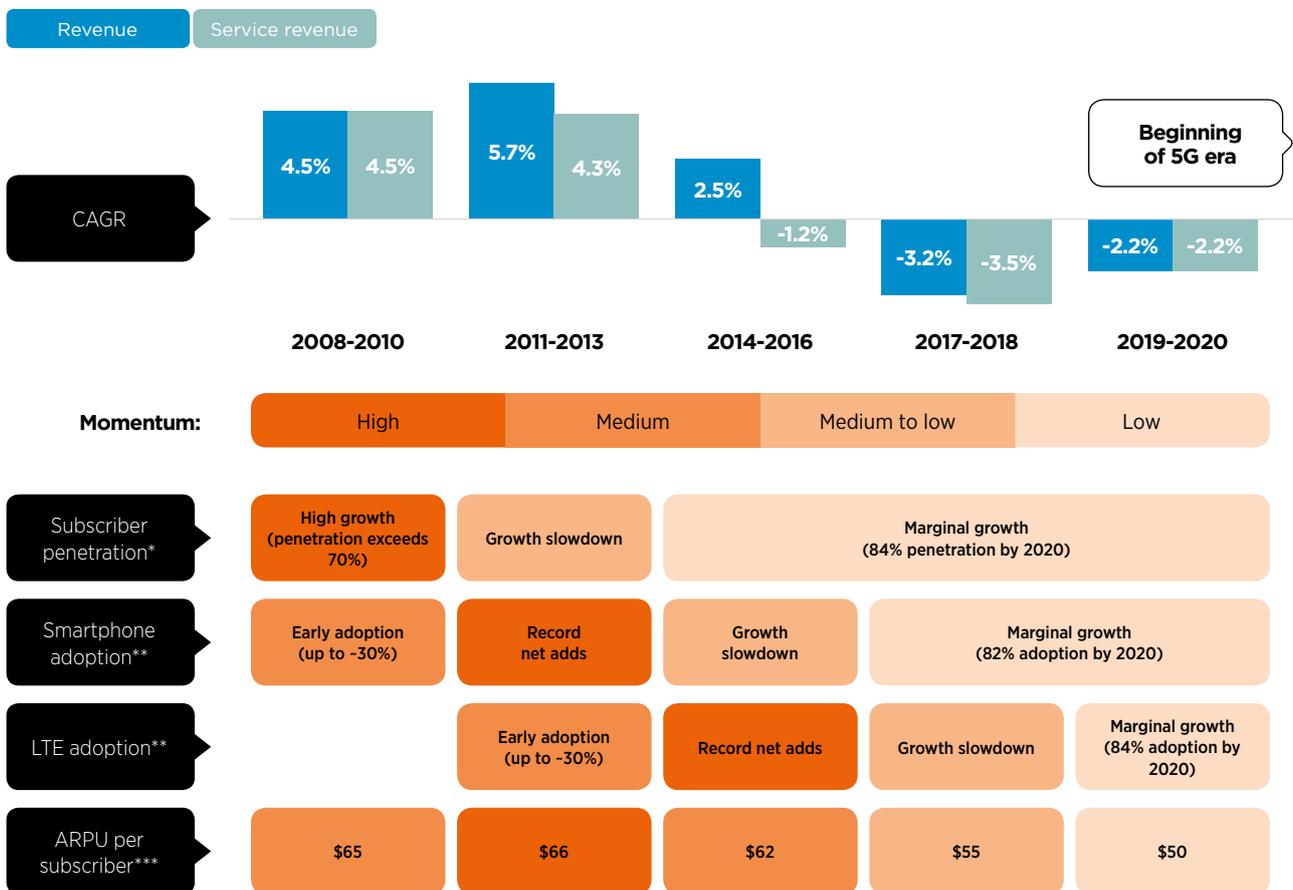
## Revenue outlook

A deeper look at the US mobile industry over the last decade (Figure 10) shows that current pressure on traditional mobile revenue is mostly due to lack of large-scale growth drivers such as migration to new technologies (e.g. smartphones, 4G) that have supported revenue growth in the past. This makes the market more vulnerable to price-driven competitive dynamics.

Figure 10

Source: GSMA Intelligence

### US mobile market cycle



\*Penetration of population. \*\*As a percentage of connections, excluding M2M.

\*\*\*Mobile service revenue divided by average number of subscribers (not connections). Average throughout the period.

Revenue growth reached its strongest momentum in 2011–2013 when two major industry forces were acting together: smartphone net additions reached their highest levels ever, thus driving ARPU uplift<sup>6</sup>; and 4G moved beyond early-adopter status.

Since then, growth has slowed. According to GSMA Intelligence’s latest forecast, traditional mobile revenues will decline during 2017–2020 at an average rate of 2.7% per year. Smartphone connections account for about 80% of total connections (end of 2016) thus leaving little room for new smartphone users and associated ARPU uplift. While there is still room for 4G connections growth – adoption will reach 84% by 2020, up from 63% in 2016 – and technology upgrades (e.g. LTE Advanced Pro), the impact on ARPU and revenue will likely be less strong than in the past.

Price competition has also increased significantly over the last few years, and will likely remain intense as challengers T-Mobile and Sprint aim to reach greater scale. All four major mobile operators now offer unlimited data plans, and their entry tariffs have declined (monthly price per line currently

ranges from \$50 to \$90). Competition will also be focused on additional features: most operators’ unlimited data plans offer discounts on secondary/multiple lines, and include HD video streaming, mobile hotspot and roaming in – and unlimited talk/text to – Mexico and Canada. AT&T also offers mobile/TV bundles (mobile bundled with DirecTV and DirecTV NOW).

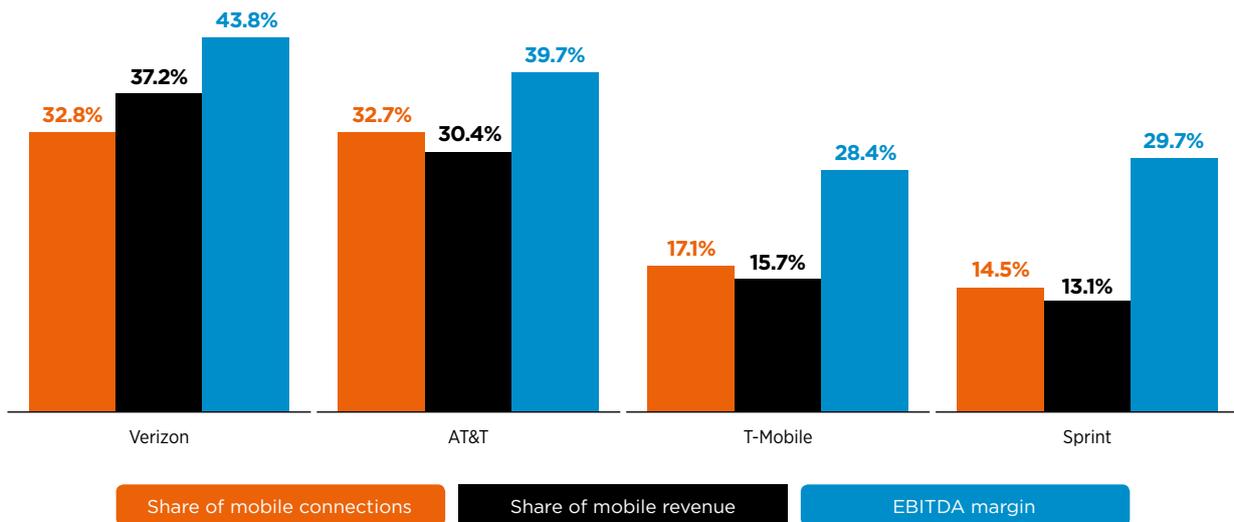
Intense price competition has increased market share fluctuations over the last few years. T-Mobile has consistently won about 1.5 percentage points of subscriber market share every year during 2014–2016 as aggressive pricing has supported the acquisition of 22 million cumulative net additions (more than 60% of total market net additions excluding M2M). This magnitude of market share variation is higher than that seen during the strong revenue growth period. T-Mobile’s subscriber growth has mostly come at the expense of Sprint, while AT&T and Verizon have been able to maintain their postpaid ARPU premium and higher EBITDA margins.

Figure 11

Source: GSMA Intelligence

## Share of mobile connections and revenue and EBITDA margin in the US

2016



Note: share of mobile connections includes M2M

6. AT&T claimed a 2x ARPU uplift (smartphone versus non-smartphone) in 2014 when smartphone growth was at its greatest momentum.

## Financial outlook

Despite pressure on traditional mobile revenues, the country-level EBITDA margin will remain almost stable over the next four years at 37-38% of revenue<sup>7</sup> due to further phasing out of handset subsidies and operators' initiatives to improve productivity and gain efficiencies. For example, Verizon's unsubsidised service pricing accounted for about 75% of its postpaid base in Q2 2017. AT&T is on track to deliver more than \$2.5 billion in cost synergies (annual run rate) following the integration of its mobile business with DirecTV.

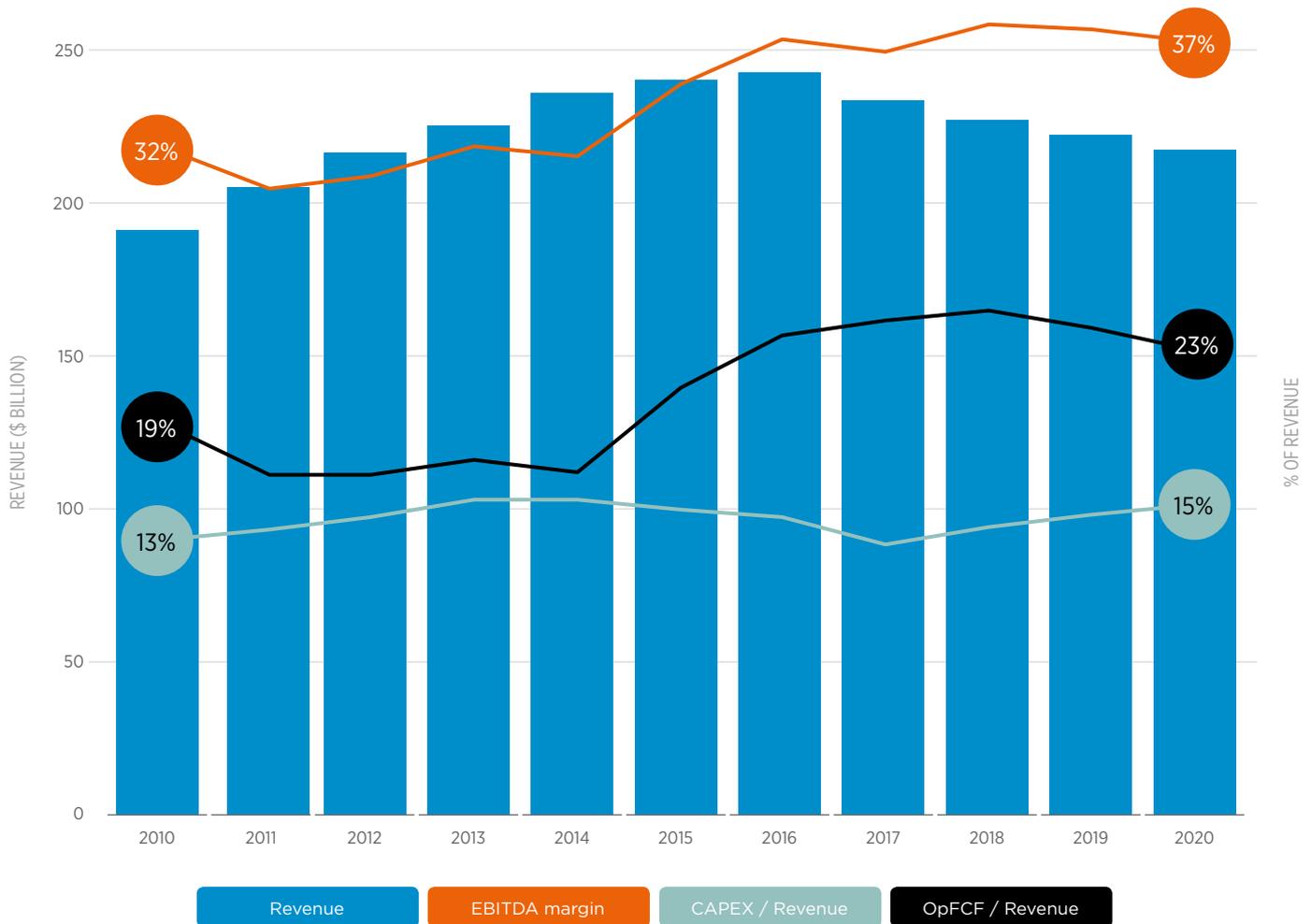
A stable EBITDA margin coupled with lower levels of capex compared to the last three years will allow the

US to maintain its high cash-flow generation at 23-24% of revenue to 2020. Between 2010 and 2016, US mobile operators have invested more than \$220 billion in both spectrum and network equipment. Between 2017 and 2020, capex will be \$125 billion, mostly driven by network maintenance, LTE Advanced Pro deployments and early 5G rollouts that are likely to require densification by deploying small cells, new antennas and transmission upgrades. Subsequent expansion of 5G to a larger footprint could require further incremental capex, above the \$32 billion expected in 2020.

Figure 12

Source: GSMA Intelligence

### Key financials for US



Note: OpFCF: EBITDA minus capex

7. The significant increase in EBITDA margins in 2015 and 2016 also reflects accounting differences between handset subsidies, which are being phased out, and equipment instalment plans which produce a temporary, positive variation in margins while the new payment methods are being phased in. Ultimately once subsidies are nearly fully eliminated over the next years, the effect will revert to normal.

## 2.6 Leading US operators are moving beyond their core businesses in an evolving ecosystem

The global TMT industry is undergoing a phase of cross-sector M&A that is accelerating convergence of telecoms and media, and giving rise to ecosystem conglomerates with operations across multiple businesses. AT&T and Verizon are among the most active cross-sector acquirers, along with other large companies such as Google, Facebook, Amazon, Samsung, Microsoft, Softbank and Cisco.

AT&T is taking a lead position in the global media and entertainment industry following the acquisition of DirecTV and the announced acquisition of Time Warner.<sup>8</sup> The AT&T/Time Warner deal will further strengthen AT&T's mobile/video strategy by adding a suite of owned media content and studios to existing AT&T's capabilities. AT&T has also increased the size of its international operations not only through DirecTV – which has 14 million pay-TV

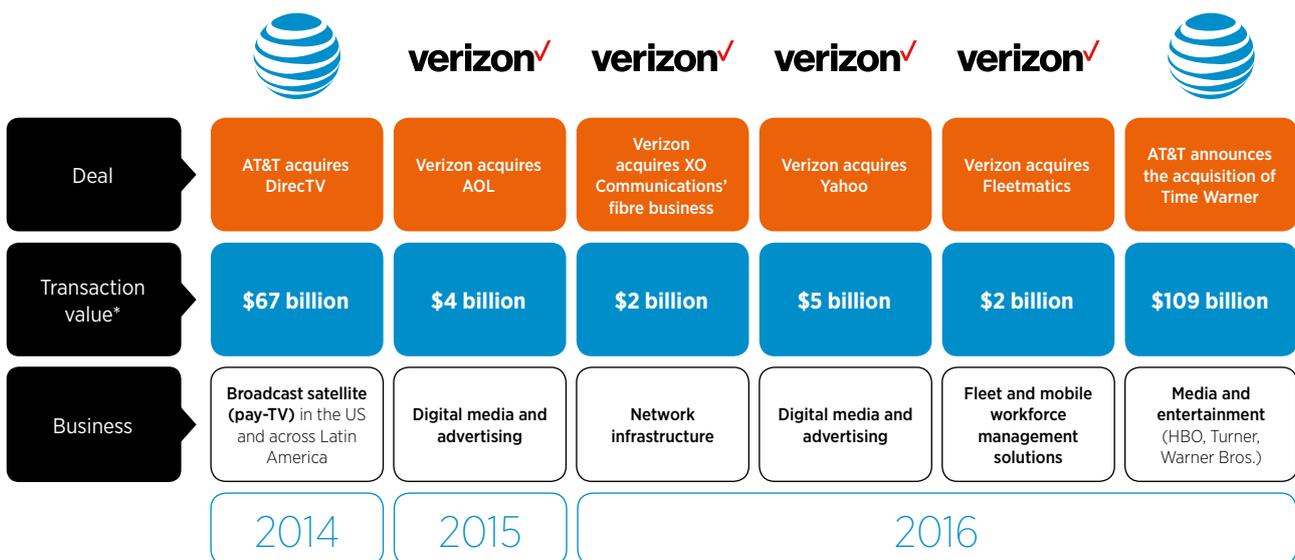
customers across Latin America (as of June 2017) – but also through the acquisition of mobile operators Nextel and GSF in Mexico.

Verizon has also made a number of acquisitions across several areas – digital media, advertising, networks and IoT. In June 2017, it combined its Yahoo and AOL assets to create a new subsidiary – Oath. Oath gives Verizon a platform of 1 billion users as well as capabilities in the digital advertising industry that – according to the company – is projected to be a \$90 billion global market opportunity by 2020. Telematics and smart cities are key IoT markets for Verizon; it has made a number of acquisitions such as Hughes Telematics, Telogis, Fleetmatics and smart-city start-up Sensity Systems over the last few years.

Figure 13

Source: GSMA Intelligence, company data

### US mobile operators: recent M&A deals



Not exhaustive list. Timeline refers to deal announcement. Major deals only (> \$1 billion transaction value).

\*Enterprise value

8. The AT&T/Time Warner deal is subject to regulatory approval. The US mobile operator expects to close it before the end of 2017.

M&A has also changed the operators' revenue mix. If the acquisition of Time Warner completes, AT&T's Media and Entertainment business – including DirectTV already – will reach about \$70 billion in revenue (aggregate figure). This will account for nearly 40% of AT&T's total revenue, almost as big as that of mobile (see Figure 14).

There is also significant room for cross-selling as AT&T has 77 million postpaid subscribers and 25 million video customers in the US. AT&T's mobile/video bundling strategy is delivering positive results due to significant customer base overlap, and supported by enhanced customer propositions and price promotions. The number of AT&T mobile subscribers with pay-TV reached 20 million in June

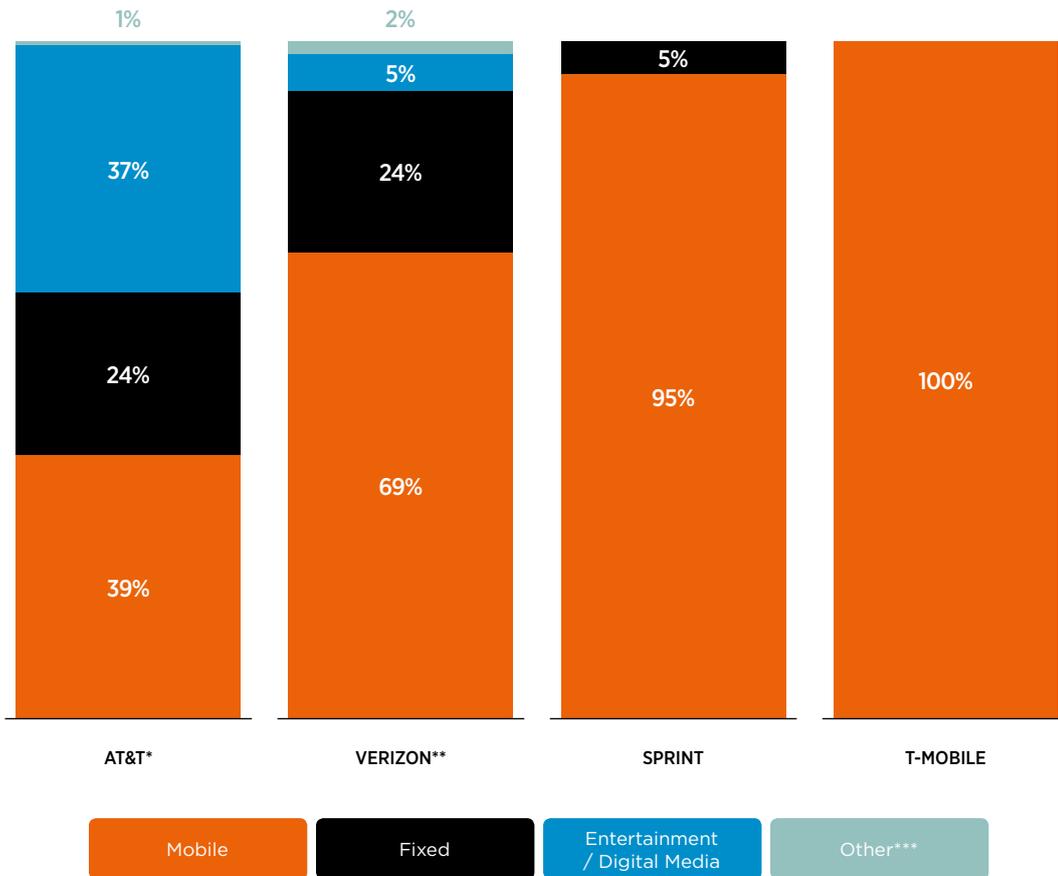
2017 or approximately 25% of the total postpaid customer base – an increasing share of those are bundled. AT&T also claimed that mobile/TV bundling success is driving postpaid churn down (to 0.79% in Q2 2017).

Mobile is still Verizon's largest business (nearly 70% of total revenue including Yahoo) but its latest acquisitions are boosting revenue in Digital Media & Advertising and IoT. Verizon's Oath subsidiary manages \$7 billion in annual revenues (2016) whereas the IoT business generated \$1 billion of revenue (2016), and is growing at about 20% year-on-year. Sprint and T-Mobile are mobile-only operators, although Sprint has nearly \$2 billion revenue from fixed voice and broadband services.

Figure 14

Source: Company data, GSMA Intelligence

## US operator revenue mix, 2016



\*Including Time Warner (aggregate). \*\*Including Yahoo (aggregate). \*\*\*Corporate, Other & Eliminations. For Verizon: most IoT revenue (e.g telematics) is included within Corporate and Other. Totals may not add up due to rounding.

## 2.7 Significant room for M&A and partnerships in wider telecoms and pay-TV industry

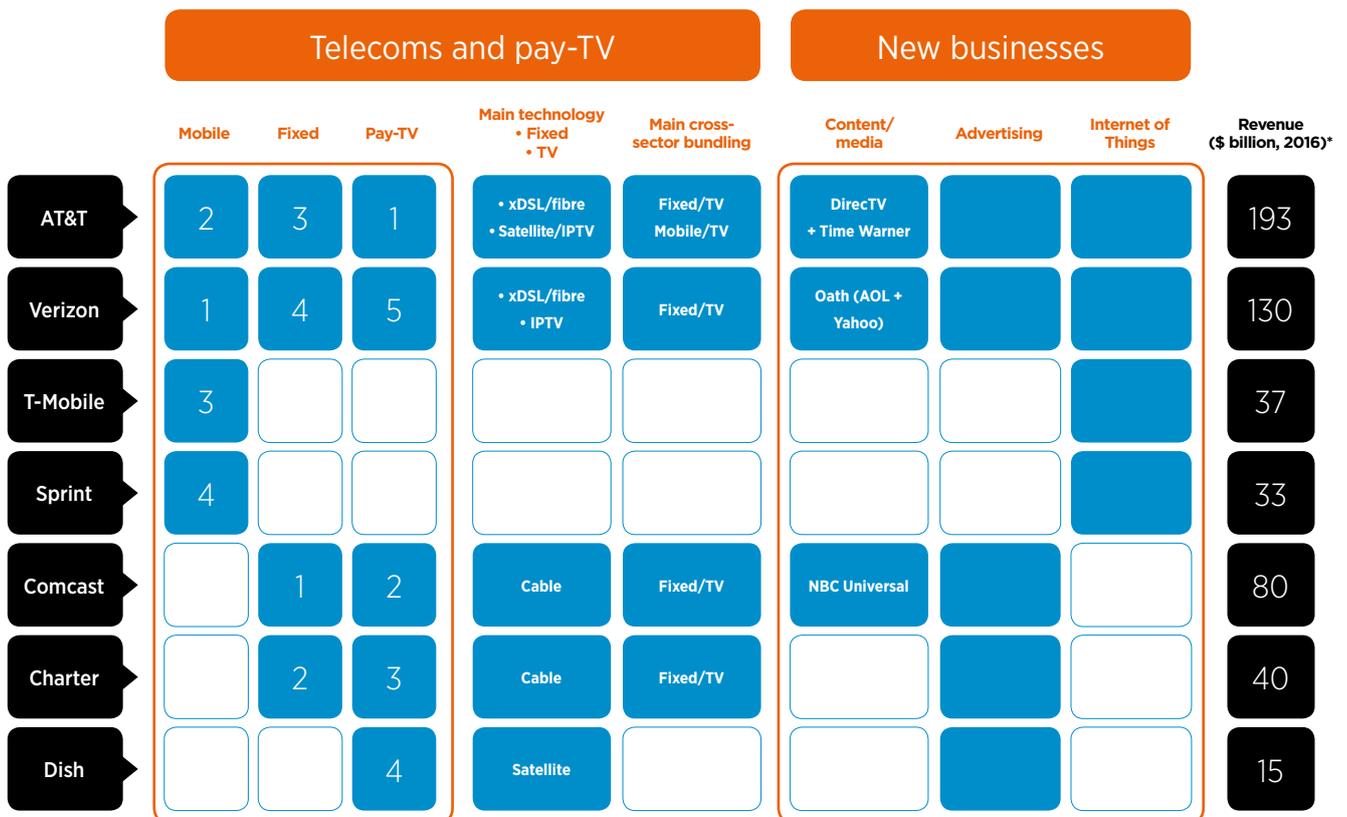
The wider telecoms and pay-TV industry is fragmented in the US, with numerous companies providing service in their core businesses only (Figure 15). This market environment is the opposite to Europe where a bi-directional wave of M&A – from mobile to fixed (mostly cable) and from fixed to mobile – has increased the number of companies with a large presence and significant market shares in all three markets (fixed, mobile and pay-TV).

Fixed infrastructure fragmentation plays a role. While all four major US mobile operators have nationwide mobile network coverage, none of the leading fixed broadband operators goes beyond fixed network coverage of 40% of population. AT&T has the widest coverage (40%), followed by cable companies Comcast (35%) and Charter (30%), and then Verizon (22%).<sup>9</sup>

Figure 15

Source: GSMA Intelligence

### Leading US companies across mobile, fixed and pay-TV markets



Companies with significant market share only (therefore MVNOs such as Comcast are excluded) and significant operations across businesses. 1-5 indicates market share ranking (2016, by number of mobile, fixed broadband and pay-TV connections).

\* GSMA Intelligence analysis of company data. AT&T includes Time Warner (aggregate). Verizon includes Yahoo (aggregate).

9. <https://www.broadbandmap.gov/>



AT&T has the broadest portfolio of services, with mobile and media at the heart of its strategy. Following the acquisition of satellite company DirectTV, it became the largest pay-TV service provider in the US (25 million subscribers as of June 2017). Verizon provides all three services as well, but it has lower fixed infrastructure coverage and fixed broadband market share compared to AT&T. It currently does not offer bundled services beyond triple play (fixed voice, broadband and pay-TV).

Comcast and Charter are leading players in the fixed broadband and pay-TV markets, but they have virtually no mobile presence. Comcast launched its MVNO service – Xfinity Mobile – in April 2017 for fixed and pay-TV customers in its coverage areas. The service runs on Verizon’s network but includes access to Comcast’s existing 16 million Wi-Fi hotspots. Comcast aims to launch its MVNO service in 2018.

The current industry fragmentation offers opportunities for companies to expand into adjacent markets through M&A or partnerships. Any further M&A deals will likely have a significant impact on the future competitive landscape and on revenues and profitability in the US mobile market. Convergence

and lighter touch regulation are likely to drive further deals, with the latter potentially opening the door to consolidation between mobile operators.

However, different M&A scenarios are possible, from mobile consolidation to cross-sector convergent deals (e.g. mergers or partnerships between mobile and cable companies). The first scenario provides the greatest scope for operating synergies and could see a more stable competitive outcome, while the latter could increase competitive pressures as new players compete for share.

Importantly the integration of businesses (fixed, mobile, TV), operations and networks does not necessarily lead to service convergence (e.g. bundling). It has been the case across many European markets (notably Spain, France, Portugal, Belgium and the Netherlands) but it largely depends on local market conditions such as infrastructure overlap (fixed and mobile), degree of competition from mobile- and fixed-only companies, operator willingness to offer bundle discounts, and the current price levels across all services – mobile, fixed and pay-TV.



# 3

Mobile contribution to economic growth and employment

# 3.1 Direct economic contribution of the mobile ecosystem

The mobile ecosystem consists of mobile operators, infrastructure service providers, retailers and distributors of mobile products and services, handset manufacturers and mobile content, application and service providers. The direct economic contribution to GDP of these firms is estimated by measuring their value added to the

economy, including employee compensation, business operating surplus and taxes.

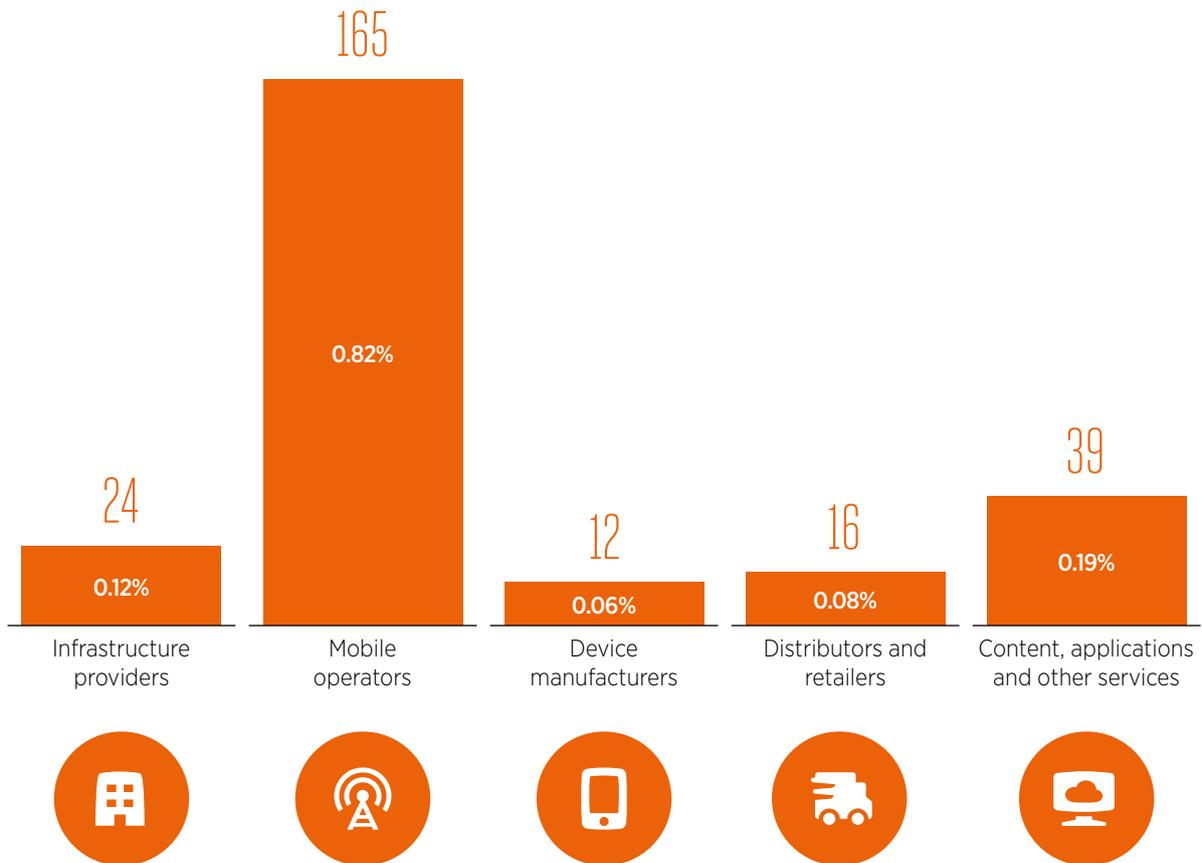
In 2016, the total value added generated by the mobile ecosystem in North America was \$256 billion (or 1.3% of GDP), with network operators accounting for the majority of this.

Figure 16

Source: GSMA Intelligence

## Direct contribution of the mobile ecosystem to GDP

(2016 \$ billion, % 2016 GDP)



## 3.2 Indirect and productivity impacts of mobile technology

In addition to their direct economic contribution, firms in the mobile ecosystem purchase inputs from their providers in the supply chain. For example, handset manufacturers purchase inputs from microchip providers, and content providers require services from the IT sector. Furthermore, some of the profits and earnings generated by the ecosystem are spent on other goods and services, stimulating economic activity in those sectors. We estimate that in 2016, this additional economic activity generated a further \$163 billion in value added (or 0.8% of GDP) in North America.

The use of mobile technology also drives improvements in productivity and efficiency for workers and firms. For many years, people in

North America have been using mobile voice and messaging services to communicate more efficiently and effectively. They also use mobile data and internet-based services extensively over 3G and 4G networks. M2M and IoT are allowing the digitisation of services and improvement of industrial processes. As these technologies are increasingly adopted, we expect them to drive significant benefits through cost savings and efficiency gains in areas such as manufacturing, logistics and retail.

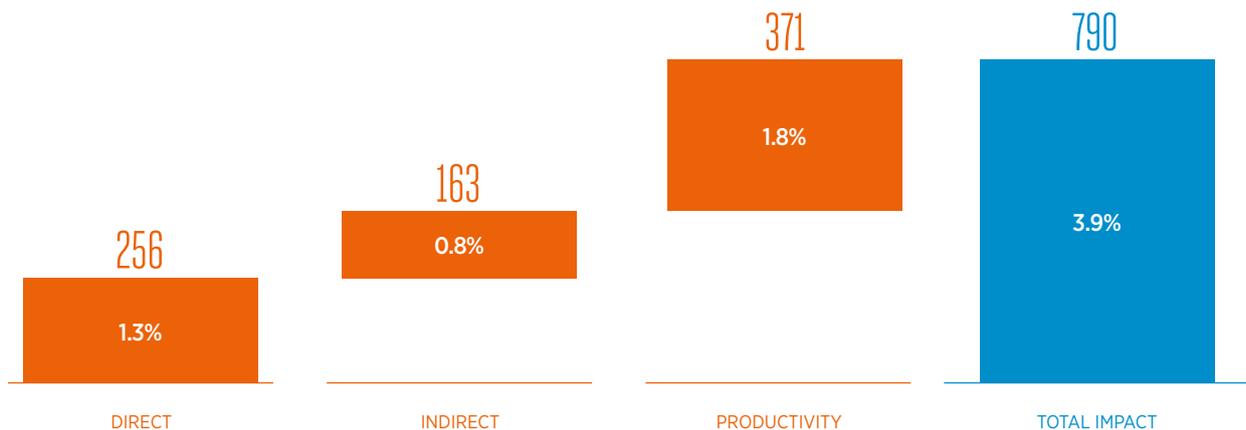
Productivity impacts from M2M alone contributed \$33 billion to the North American economy in 2016. In total, we estimate the overall productivity impact from using mobile services was worth around \$371 billion in 2016 (or 1.8% of GDP) in North America.

Figure 17

Source: GSMA Intelligence

### Total (direct, indirect and productivity) contribution to GDP

(\$ billion, % 2016 GDP)



Totals may not add up due to rounding.

Overall, taking into account the direct, indirect and productivity impacts, in 2016 the mobile industry made a total contribution of \$790 billion to the North American economy in value added terms, equivalent to 3.9% of the region's total GDP.

# 3.3 Employment and public funding contribution

## Employment

In 2016 mobile operators and the ecosystem provided direct employment to approximately 1.1 million people in North America. In addition to this, economic activity in the ecosystem generates jobs in other sectors. Firms that provide goods and services as production inputs for the mobile ecosystem (for example, microchips or transport services) will employ more individuals as a result of the demand generated by the mobile sector. Furthermore, the

wages, public funding contributions and profits paid by the industry are spent in other sectors, which provide additional jobs.

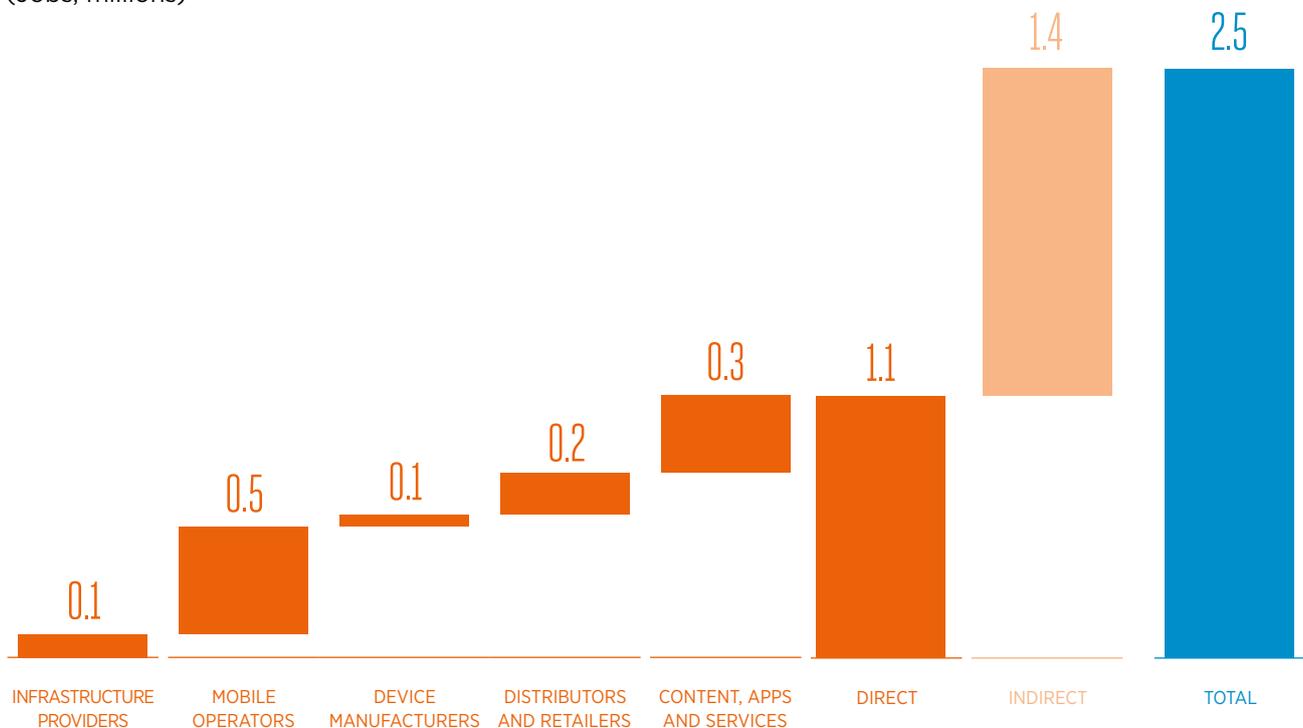
We estimate that in 2016, around 1.4 million jobs were indirectly supported in this way, bringing the total impact (both direct and indirect) of the mobile industry in North America to 2.5 million jobs.

Figure 18

Source: GSMA Intelligence analysis

### Employment impact

(Jobs, millions)



Totals may not add up due to rounding.

## Public funding contribution

The mobile ecosystem also makes a significant contribution to the funding of public sector activity in the region through taxation. For most countries in the world, this includes sales and value added taxes, corporation tax, income tax and social security from firms and employees. We estimate that the ecosystem made a tax contribution to the public finances of the US and Canadian governments

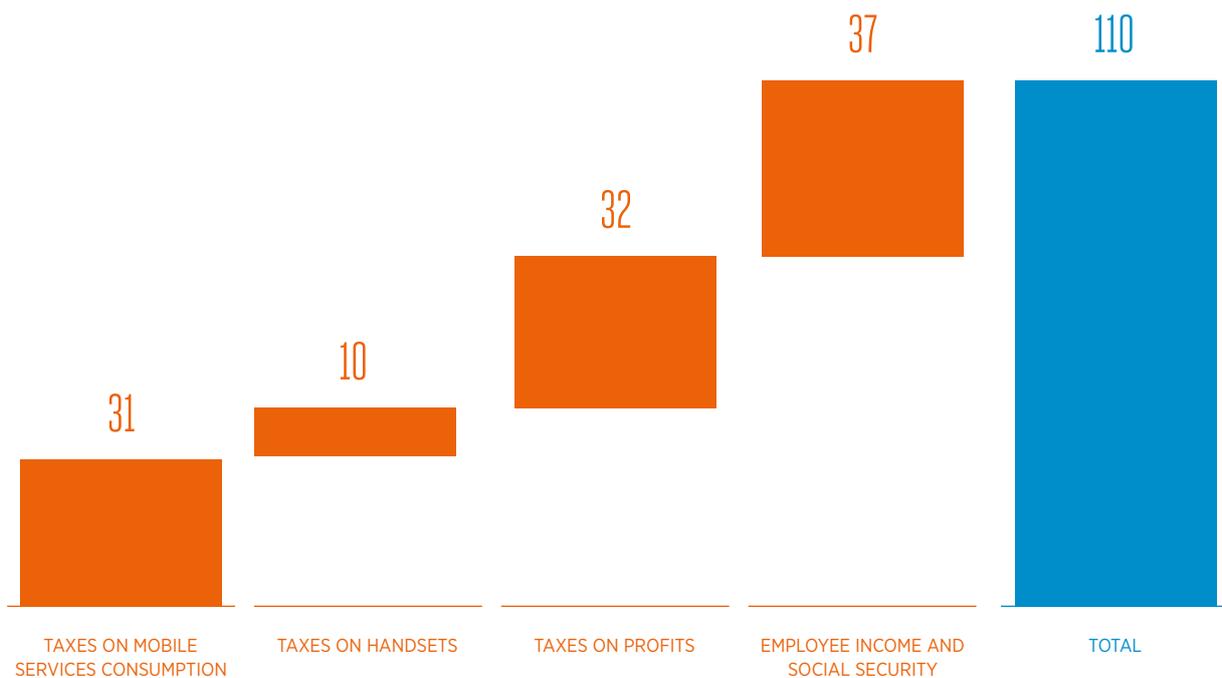
of \$110 billion in 2016. This does not include the significant contribution made by the mobile industry in the US to the \$8 billion Universal Service Fund.<sup>10</sup> A recent report estimated that mobile consumers in the US pay an average of 6.6% of their total bill to fund universal service in addition to other service taxes.<sup>11</sup>

Figure 19

Source: GSMA Intelligence

### Contribution to public funding by the mobile industry

2016 \$ billion



Totals may not add up due to rounding.

10. Universal Service Administrative Company 2016 Annual Report

11. Wireless Tax Burdens Rise for the Second Straight Year in 2016, Tax Foundation, 2016

# 3.4 Outlook and trends for the period 2016–2020

We expect the economic contribution of the mobile ecosystem in North America to continue to grow. In value-added terms, we estimate that the ecosystem will generate more than \$1 trillion by

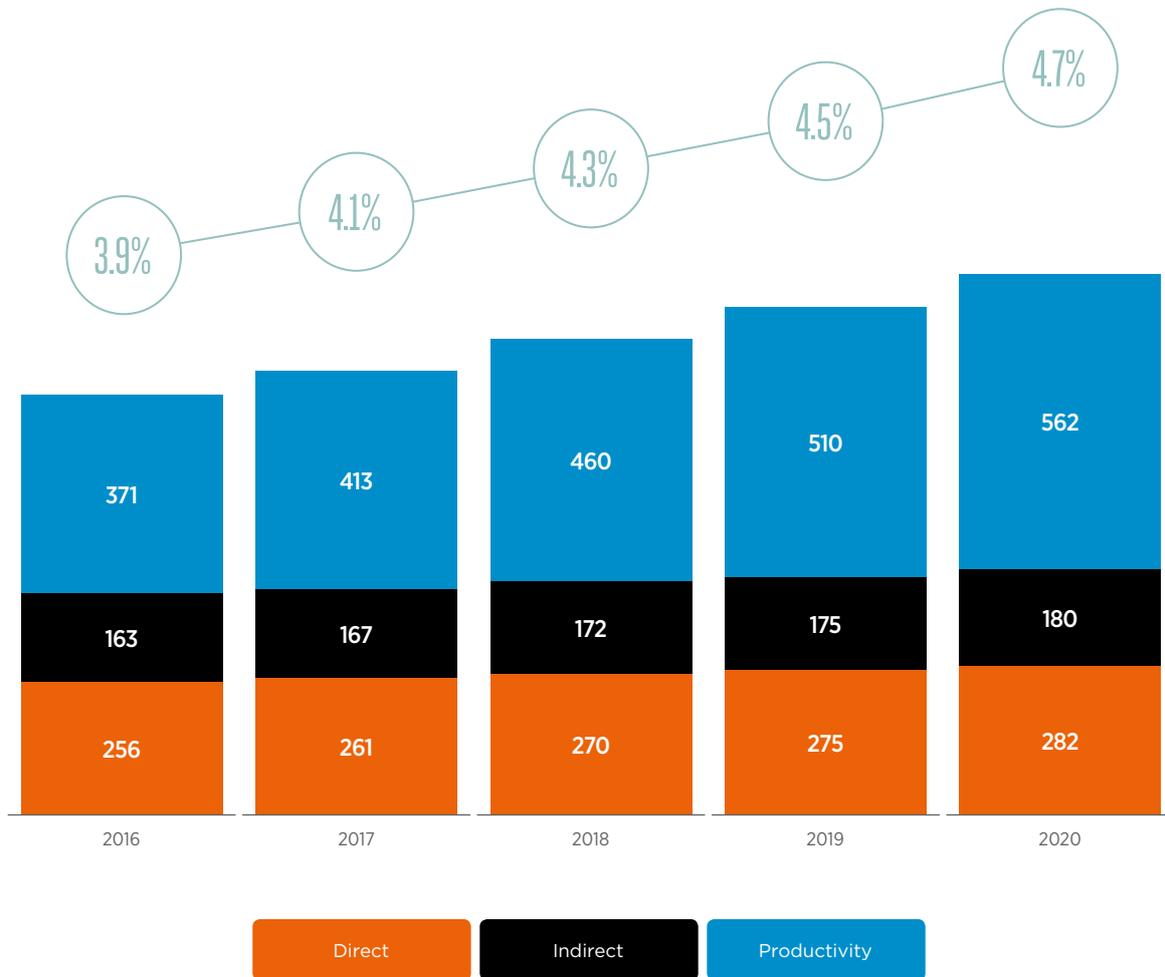
2020, representing 4.7% of GDP. The majority of this increase is due to improved productivity driven by continued adoption of M2M and IoT technology and the increased digitisation of industry and services.

Figure 20

Source: GSMA Intelligence

## Outlook to 2020

\$ billion and percentage of GDP





# 4

# North America at forefront of technology and ecosystem

# 4.1 Vibrant investor financing is supporting technology developments and innovation

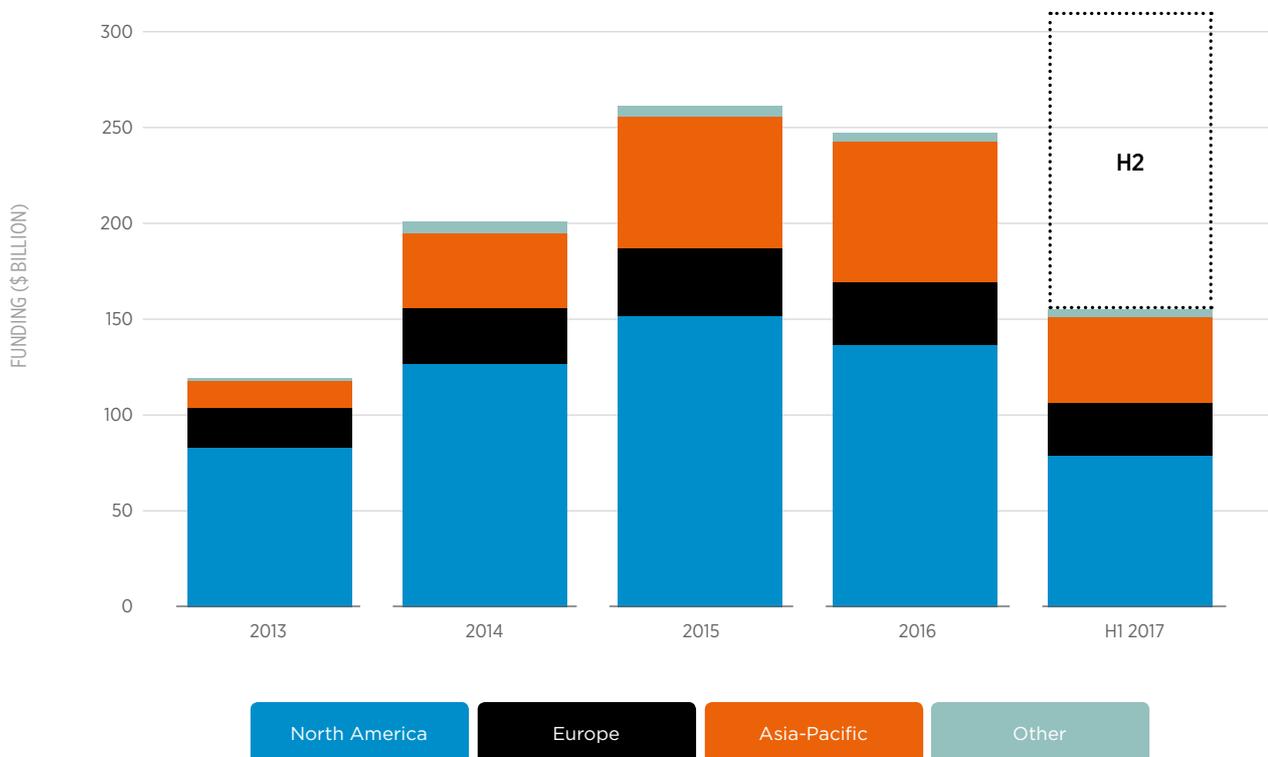
In North America, private equity companies, venture-capital firms and corporates have invested more than \$0.5 trillion between 2012 and 2016 to finance tech start-ups and emerging companies across several sectors – TMT, energy/utilities, automotive/transportation, healthcare and banking/finance. Digitisation of industry is a fundamental catalyst for VC financing; it is expanding the value chain in many sectors and opening up new roles and opportunities.

The first half of 2017 showed an acceleration in funding and number of deals that – if confirmed in the second half – would lead to an all-time record of financing for the year in North America. The US is the largest market worldwide: it accounts for half of global financing, though its share is declining due to the rise of China and India. The level of funding confirms the role of North America as the heart of tech innovation and digital transformation, and is providing valuable support to growth and developments in the wider mobile ecosystem.

Figure 21

Source: CB Insights

## Investor financing



Note: H2 2017 is an indicative estimate based on H1 2017. There has been little/no seasonality over the last few years.



## 4.2 IoT is becoming mainstream and will reach nearly 6 billion connections by 2025

North America is leading developments in the IoT ecosystem, with a growing range of start-ups backed by robust financing and a supportive ecosystem for innovation. Amazon, Cisco, GE, Google, Intel and Qualcomm – among others – have invested significant amounts into the developing IoT arena over the last five years.

Mobile operators are playing a leading investor role too, through acquisitions (e.g. Verizon in telematics and smart cities) and funding. In July 2017, AT&T committed to invest up to \$200 million in a venture-capital fund. It will work with Coral's Communications Industry Platform (CIP) team to identify and invest in start-up companies focused on connected services and platforms.

According to Machina Research (August 2017), the number of IoT connections will increase fourfold between 2016 and 2025 in North America, reaching nearly 6 billion.

US mobile operators are driving growth in IoT through network developments (e.g. mobile IoT technology<sup>12</sup>) and the provision of IoT solutions beyond connectivity, often via partnerships. Verizon and AT&T have announced nationwide launches of LTE-M technology, while T-Mobile aims to launch its NB-IoT network in 2018. Meanwhile, Sprint has outlined plans to deploy LTE-M in 2017 and 2018, and NB-IoT thereafter. Opportunities exist for operators to lease spectrum to companies that want to run private networks. For instance, AT&T and Nokia have partnered to offer private LTE networks to utility companies.

Verizon and AT&T provide IoT services across several verticals, including those that have been attracting significant investor financing over the last few years (see Figure 22). Verizon, in particular, has significant presence in the telematics sector following its acquisitions of Hughes Telematics and Fleetmatics. Its IoT business generated \$1 billion of revenue in 2016 and is growing at about 20% year-on-year.

12. Mobile IoT refers to low power wide area (LPWA) 3GPP-standardised, secure, operator-managed IoT networks in licensed spectrum. In particular, LPWA networks are designed for IoT applications that are low cost, use low data rates, require long battery lives and often operate in remote and hard-to-reach locations.

Figure 22

Source: GSMA Intelligence

## Key IoT markets and players (not exhaustive)



## 4.3 Smart cities: building the city of the future

Implementation of smart city technology is gaining momentum in the US, driven by public and private funding, and an increasing number of companies engaged throughout the value chain. This ranges from the provision of underlying hardware (e.g. Phillips, GE) to connectivity and software solutions (e.g. AT&T, Verizon, Intel, Microsoft, Cisco). The number of smart city projects is on the rise in the US across major metropolitan cities (see Figure 23). To accelerate deployments, the US government committed more than \$160 million at the end of 2015 to federal research and collaborative projects in

smart city technology.

Smart street lighting has gained particular traction in the US with several high-profile projects in progress. In part, this is due to the significant cost savings it generates – for instance, Los Angeles has achieved savings of \$9 million per year, and a similar project in San Diego is expected to achieve savings of \$2.4 million. In addition, smart street lamps can become central hubs to collect additional data on a range of metrics including air pollution and traffic flow.

Figure 23

Source: GSMA Intelligence

### Smart city projects in the US



Verizon and AT&T are engaged in smart city projects in the US through partnerships with governments, city planners and other technology companies. Main areas include smart transport solutions to reduce congestion and optimise use of public transport; water management; remotely connected CCTV and automated incident detection; parking; and smart street lighting.

AT&T has been involved in several smart lighting initiatives, including those in Atlanta and San Diego. Meanwhile, Verizon has helped deliver a broad

range of projects, including a public safety solution in Charleston, South Carolina and a connected lighting scheme in Boston. In addition to offering fully owned business solutions, mobile operators are also partnering with hardware and software companies to provide services while focusing on the connectivity element of the project. For example, AT&T has partnered with GE to provide smart city solutions in Atlanta and San Diego.

## 4.4 Autonomous vehicles are moving beyond their infancy

The development of autonomous vehicles is seeing increased momentum in North America, with a growing range of players developing innovative solutions. Silicon Valley tech giants such as Google, Apple and Uber, as well as major automobile manufacturers including GM, Ford and Mercedes, are trialling autonomous vehicles, while Tesla is already selling cars with limited autonomy.

Over the last few years, California has become a hub for testing self-driving cars, with 37 companies currently holding permits to run trials.<sup>13</sup> While several states have passed legislation related to autonomous vehicles, US Congress is working on national self-driving vehicle legislation that could replace state-by-state rules and make it easier for companies to test and deploy their technologies.

Beyond self-driving cars, autonomous vehicle solutions are under development in the region for aviation, rail, shipping and agriculture. The automation of the trucking industry is an emerging

use case that has attracted the attention of start-ups, automobile manufacturers and large US-based tech companies. While companies such as Daimler are incorporating elements of autonomy into their vehicles, others such as Waymo and Otto, subsidiaries of Alphabet and Uber respectively, have begun testing fully automated solutions.

The drone market is also growing rapidly, driven by a multitude of use cases (see Figure 24), increasing device capability, falling prices and new FAA regulations for commercial drones introduced in August 2016. Several companies, notably Amazon and Google, are exploring use cases for automated drones, particularly for last-mile shipping. The US government has most recently said that unmanned aircraft could lead to \$82 billion in economic growth by 2025 and support up to 100,000 jobs in the US.<sup>14</sup>

13. "Testing of Autonomous Vehicles", Department of Motor Vehicles, State of California

14. "U.S. commercial drone use to expand tenfold by 2021: government agency", Reuters, 2017

Figure 24

Source: GSMA Intelligence

## Use cases for drones and key players (not exhaustive)



With a large presence in the connected car market and established telematics and vehicle connectivity solutions, US mobile operators are looking to play a key role in the automated vehicle market. After acquiring Fleetmatics and Telogis in 2016, Verizon has invested in Renovo, an autonomous vehicle start-up, and acquired Skyward, a drone company.

Meanwhile, AT&T has established partnerships with several automakers – most notably, Ford and Honda, which it partnered with to launch the Vehicle-to-Anything (V2X) communication platform. AT&T has also partnered with the American Centre for Mobility, a non-profit testing and product development facility in Michigan, allowing it to accelerate the development of its platform.

5G will provide the high-capacity, low-latency networks required to facilitate the development of the autonomous vehicle ecosystem and will enable the provision of a suite of entertainment services and content. New network solutions built into the 5G network will also help manage demand. For instance, edge computing will store more of the caching and content at the edge of the network, while network slicing will allow operators to prioritise specific verticals such as automotive over less critical services such as media streaming.

# 4.5

## Artificial intelligence will increasingly be the new focus area

AI-related financing and M&A activity has reached unprecedented levels worldwide, with US companies leading the way. The industry is currently dominated by six platform players – Google, Amazon, Apple, Facebook, Microsoft and IBM – which provide solutions across most use cases and verticals, including initial applications such as chatbots, virtual agents and smart personal assistants (e.g. Alexa, Cortana, Google Assistant, Siri and M).

Figure 25

Source: GSMA

### Artificial intelligence: key players and use cases (not exhaustive)

						
AI chips	✓		✓			
Digital assistants	✓	✓	✓	✓	✓	✓
Chatbots	✓		✓	✓	✓	
AI in own services	✓	✓	✓	✓	✓	✓
Health solutions	✓		✓			✓
Smart home	✓	✓	✓		✓	
Connected cars	✓					✓
Intelligent cloud	✓	✓			✓	✓
AR/VR	✓	✓	✓	✓	✓	
Connectivity	✓			✓		

Chips

Applications

Infrastructure & technology

Connectivity



Mobile operators in the US have also increased their focus on artificial intelligence, with widespread recognition that AI is increasingly key to business transformation across several dimensions (e.g. devices, networks, B2C and B2B services) and IoT developments. Devices are a notable example as innovation is shifting from smartphones to a surrounding ecosystem of devices and accessories, often connected to smartphones. These include fitness trackers, smart watches, connected home devices and VR/AR devices.

AI is also closely linked with IoT and autonomous vehicles as it helps process the enormous quantities of data gathered. The option to monetise data generated by IoT will create further potential revenue streams and is seen by mobile operators as an important element of the business opportunity.

In February 2017 Verizon launched Exponent, a new technology and business venture offering a portfolio

of software and internet platforms that includes both IoT and AI solutions. Verizon has also invested in AI companies through its venture-capital arm, most notably investing in SparkCognition, an AI-based security platform. Meanwhile AT&T has been developing AI solutions through AT&T Labs, focused on solving software-defined networking (SDN) and storage challenges for the operator.

AI creates opportunities for US mobile operators to further optimise their networks and CRM systems, and increase operational efficiencies. Improved understanding of customer behaviour and preferences will also enhance B2C services within and beyond core businesses. At the same time, new challenges are emerging such as the rise of voice-driven, Wi-Fi-connected, AI-based devices (e.g. Amazon Echo, Google Home) that are increasingly becoming a control point for the connected home.

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